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WEIGHING PAN FOR PROTECTING THE PRODUCT TO BE WEIGHED

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WEIGHING PAN FOR PROTECTING THE PRODUCT TO BE WEIGHED

[Waagschale zum schutz des wägeguts]

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For an explanation of the two-letter codes and the other abbreviations, reference is made to the explanations ("Guidance Notes on Codes and Abbreviations") at the beginning of each regular issue of the PCT-Gazette.

The invention concerns a weighing pan, which is particularly suitable for use with scales /1* which must meet special requirements in terms of the placement of the product to be weighed, namely, comparator scales, wherein the weighing pan is designed in a manner which serves the protection of the product to be weighed.

As a rule, there are instructions for handling scales properly. Also, the handling of the product to be weighed during placement on the weighing pan and the carrying out of the weighing operation, in particular, in the laboratory area, is stipulated by regulations or by so-called "Standard Operating Procedures" (SOP). The goal of these instructions is to keep the scales and also the product to be weighed free from any damage, as much as possible. The more sensitive the scales, the greater will be the probability that even with the greatest care, both the weighing pan and also the highly sensitive product to be weighed will exhibit signs of stress over the course of time. This is shown in the following with the aid of comparator scales.

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* [Numbers in right margin indicate pagination of the original text.]

Comparator scales, as they are described, for example, in DE-U-295 17 368, must satisfy the highest requirements with respect to resolution and repeatability. Likewise, the test weights, whose mass or volume is compared on such scales with a known reference, are divided into classes with regard to their mass-tolerances, in accordance with international norms. Other requirements exist with regard to physical characteristics, such as shape, material, density, surface /2
characteristics, and so forth. The main users of comparator scales are national mass laboratories, calibration offices and private and in-house calibration laboratories. The development of comparator scales, in particular, however, their weighing pan, therefore demands a gentle handling of the test weights and reference weights, so that even after ca. one million weighings, mass loss by wear cannot be detected. Such a loss can be discerned, for example, with the aid of fine scratches in the surface, which is otherwise polished to a high gloss.

Up to now this had to be accepted, since the weighing pans are made of metal (aluminum or steel), which is preferably hardened for wear resistance. As a result, the only remedy, in any case, after a longer period of use, is a reclassification of a test weight after a determined mass loss.

One approach to a solution of this problem is to harden the surface of the test weights, as described in US Patent Application No. 665,799.

For other comparator scales found on the market, protection of the test weights consists in providing the weighing pan with a cork plate cemented on it. The disadvantage here, however, is that this damping material is not wear-resistant and therefore small particles can remain suspended on the test weight and can subsequently falsify the weighing result. Furthermore, a rapid ageing of this material has to be assumed, which requires a relatively frequent renewal of the support. As a natural material, cork is subject to fluctuations, with regard to its physical characteristics, for /3
example, the granularity and thus the surface roughness or the water absorption, which results in procedures having to be adapted, again and again, as described, for example, in DE-U-295 17 368, in the course of the weighing operation, such as the centering of the test weights on a suspended weighing pan.

The aforementioned centering method provides for the test weight to first lie on a platform or, to stand, for example, in the case of OIML weight. The weighing pan, installed preferably suspended, is designed in such a way that it penetrates the platform, which can be moved up and down, and thus, in the downwards movement of the platform, the test weight takes over from it. If the test weight is placed eccentrically on the weighing pan, then this tends slightly toward the common center of gravity of the weight and weighing pan and thus brings the weight closer to the center of the platform. A multiple repetition of the operation centers the weight iteratively on the weighing pan. The centering of the test weights on the weighing pan of comparator scales is very important for a precise measurement, but does not always succeed with the method described above, especially not if the test weight slips on the weighing pan.

The friction between the test weight and the weighing pan can be improved by roughening the surface of the weighing pan, but this, in turn, favors the mechanical stress of the test weight by the weighing pan.

The problem of the invention is therefore to develop a weighing pan so that a lying product to be weighed can neither slip nor is damaged in any way. At the same time, protection of the weighing pan is also promoted. /4

The problem is solved, in accordance with the invention, in that the weighing pan is provided with a coating of a polymer varnish.

The coating of a weighing pan, which is to satisfy the aforementioned high requirements, is awkward and therefore unusual both with regard to the selection of the material and also its application on a carrier. It has been shown, however, that polymer varnish can be applied permanently with justifiable expense and exhibits a particularly favorable combination of characteristics, namely a moderate hardness of the coating, which prevents a scratching of the test weights placed on the weighing pan, and their surface characteristics, which prevents a slipping of the weights by a sufficiently high sliding and adhesion friction. Furthermore, it is possible, so as to avoid electrostatic charges of the weights, to make the coating sufficiently conductive by the addition of electrically conducting fractions, so-called antistatic agents, to the varnish mixture, without changing the remaining characteristics more than insubstantially by such an addition.

The coating with polymer varnish is resistant with respect to solvents, such as alcohols, benzenes, and acetone, as they are used, in particular, to clean the weighing pan, and furthermore, with respect to known agents for the density determination, for example, water as the standard medium, FC40, or silanes in a mixtures, in particular, with cyclosilane, as it is described in EP-A-1 054 248.

It is clear that the coating should have a good adhesion on the substrate—here on the weighing pan—since it is not desired that the coating be renewed at short time intervals, or that as a result of insufficient wear resistance, coating residues accumulate on the test weights or that they be found in the liquid, which must be avoided, especially in the case of weighing pans for a volume comparator. /5

One should mention, as a special advantage of the coating of a weighing pan, that it also receives corrosion protection and in this respect, its service life is prolonged.

The coated weighing pan has a uniform planar surface, which particularly facilitates the centering operation described above. The coating is, moreover, elastic, wherein a placed weight does not leave impressions on the surface after the weighing operation has ended, and accordingly, such a weighing pan can be used for a long period of time.

Other details of the invention are made clear with the aid of the following description of the embodiment of a weighing pan, shown, by way of example, in the drawing. The figure shows the following:

Figure 1: an embodiment of a weighing pan, as it is used in a mass comparator.

Figure 1 shows a platform 1, known from the state of the art, to support the product to be weighed, which is supported so that it can be rotated around an axis A and is designed as a sample changer. In the form of three-beam crosses, four positions are designed to hold test weights as slits 5 (with a width b). Platform 1 can move in a vertical direction, so that a crosslink-shaped, three-beam weighing pan 9 can pass through the slits and can lift a test weight 11 (shown with a broken line in the figure) from the surface of the platform. /6

The crosslinks 7 of the weighing pan 9 (with the width c) are then coated, in accordance with the invention, with a layer of a polymer varnish, preferably a varnished based on polyurethane. The thickness of the coating is preferably a few 10s to 100s micrometers and is selected in such a way that, on the one hand, a uniform planar surface of the coating is attained and, on the other hand, a sufficiently high elasticity and a low hardness of the weighing pan surface are also attained. A thick layer is particularly advantageous, if the pan is used for the support of heavy and angular weights. If, on the other hand, a surface as smooth as possible is important, then it can be attained more simply with a thinner layer.

The hardness or elasticity of the coating is determined by the composition of the varnish; for thin layers, it is influenced, however, by the carrier material also. The layer should not be excessively soft. A Shore hardness D of at least 50 has proved advantageous, preferably around 80 to 100. In contrast to this, uncoated weighing pans have unevenly harder surfaces; for their protection, they are made mostly of hard eloxated aluminum or stainless steel.

Since the test weight 11 also lies on the platform 1, it is sensible to provide it, at least in the area of contact with test weights, with a coating of polymer varnish also, preferably with polyurethane as a base material. /7

It was possible to demonstrate the stress capacity of the coating with the aid of long-term tests, in which a 20-kg weight was placed one million times on the platform. With the aid of stereomicroscopic observations, it was possible to demonstrate that there were no wear phenomena. At the same time, the test weight was also subjected, on its support surface, to a careful investigation with a microscope. Here, neither wear phenomena nor depositions of a possible wear of the coating were observed. In contrast to this, a test weight, which was repeatedly placed on an uncoated platform, exhibited traces of stress in the form of small scratches, after such a long-term test on the support surface.

In order to be able to carry out the centering operation for the test weight on the weighing pan by lifting and placing several times, it is necessary for the test weight to have a sufficiently large

adhesion on the weighing pan. In comparative measurements of the adhesion friction coefficients for a coated and an uncoated weighing pan, it was possible to determine the coating material with values of 0.5 to 1 as suitable. In the case of an uncoated weighing pan, the measured value of 0.2 proves to be as insufficiently suitable to carry out the centering operation.

With an addition of up to three weight-percents antistatic agents to the varnish, consisting of curing agent and base material (polyurethane), an order of magnitude of conductivity was attained for the coating, which prevents a charging of the weight on the weighing pan and thus a falsification of the weighing result. Antistatic agents are admixed to the varnish before application as a component, for example, in the form of the product "Metaline 950" from the Schramm Company, which can be obtained on the market. An admixture of a larger fraction of antistatic agent entails the danger that the good characteristics of the varnish are influenced in a substantially negative manner. /8

For the application of the polyurethane varnish, the surface to be coated must be clean and free of grease. The coating therefore begins with a cleaning step, which can be followed eventually by a roughening of the surface and can be repeated. Afterwards, the carrier, in particular, a weighing pan, must first be grounded. This is followed by a drying period of ca. one hour—at most, however, twelve hours. Afterwards, the actual varnish is applied. This varnish consists of two components, the base material and the curing agent, which are mixed in a ratio of two to one. The mixing process is carried out carefully, since it has a considerable influence on the evenness of the layer. An addition of another component with antistatic agents of a maximum 3% of the weight of the mixture is used to increase the electrical conductivity of the finished layer. A careful mixing is required here also. The varnish is then applied in several operations, either sprayed or applied with a brush. A ventilation is required between the operations, for ca. 15 minutes in the case of spraying or 45 to 60 minutes in the case of application with a brush. After the coating, the polyurethane varnish takes a few more days to solidify. The ambient temperatures should be between +10°C and +30°C, preferably +20°C.

Claims /9

1. Weighing pan for scales, in particular, comparator scales, characterized in that the weighing pan is provided with a coating of a polymer varnish.

2. Weighing pan according to Claim 1, characterized in that the polymer varnish is composed of a base material and another component, in particular, a curing agent.

3. Weighing pan according to Claim 2, characterized in that the polymer varnish contains polyurethane as the base material.

4. Weighing pan according to Claims 2 or 3, characterized in that the polymer varnish contains antistatic agents of up to three weight-percent.

5. Weighing pan according to one of the preceding claims, characterized in that the coating is at least 10 micrometers thick.

6. Weighing pan according to one of the preceding claims, characterized in that the coating has a Shore hardness D of more than 50.

7. Weighing pan according to one of the preceding claims, characterized in that both the sliding and the adhesion friction of the coating is at least twice as high as that of the polished surface of a similar weighing pan made of hard metal. /10

8. Weighing pan according to one of the preceding claims, characterized in that the coating is resistant to solvents.

9. Weighing pan according to one of the preceding claims, characterized in that the coating is resistant to liquids for the measurement of the density of bodies, wherein, especially water, FC40 and liquids containing silane can be included.

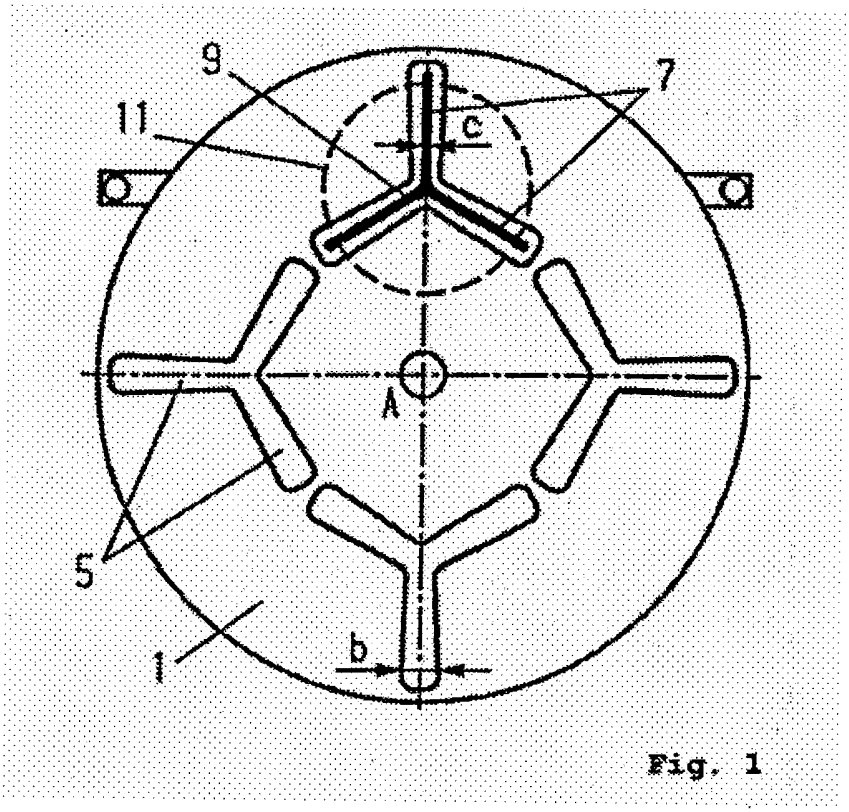

Fig. 1

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 02/00815

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01G21/22 G01G23/01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01G C09D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 304 773 A (ROGALLO VERNON L) 21 February 1967 (1967-02-21) column 3, line 3 - line 7	1
Y	---	2-9
Y	DATABASE WPI Section Ch, Week 8618 Derwent Publications Ltd., London, GB; Class A14, AN 1986-116723 XP002201166 & JP 61 057660 A (SEKISUI CHEM IND CO LTD) , 24 March 1986 (1986-03-24) abstract	2-9

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE WPI Section Ch, Week 0130 Derwent Publications Ltd., London, GB; Class A04, AN 2001-285789 XP002201167 & JP 2001 049055 A (DAIICHI KOGYO SEIYAKU CO LTD), 20 February 2001 (2001-02-20) abstract	2-9
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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